MICRO PRODUCTS COMPANY

MANUFACTURES OF PRECISION WELDING MACHINES

MODEL E1S BUTT WELDER

MODEL E1C BUTT WLEDER

SERVICE MANUAL

REVISED 2002

TABLE OF CONTENTS

1.0 SPECIFICATIONS

MODEL E1S FERROUS

Stock Size Range	.010" to .062" Diameter
Type Material	High and Low Carbon Steel and Steel Alloys
Operating Voltage	115 Volts
Input Power Cycle	60 Cycle (50 or 25 Cycle Optional)
Line Demand	3 Amperes @100% Duty Cycle 10 Amperes @10% Duty Cycle
Single Phase Weld Transformer	0.5 KVA @50% Duty Cycle
Truck Mounted Welder	2 Stationary Casters 2 Swivel Casters
Floor Space	24" x 24"
Overall Height	54"
Height to Welding Dies	45"
Welder Weight	Approx. 100 LBS
SUITABLE FOR BENCH MOUNTING	
Dimensions	
Overall Height	20"
Base Dimensions	9" x 7"
Height from Base to Welding Dies	12"
Welder Weight	Approx. 50 LBS.

MODEL E1C NON-FERROUS

Stock Size Range	.015" to .050" Diameter
Type Material	Copper, Brass, Bronze, Aluminum and Non-ferrous Alloy
Operating Voltage	115 Volts
Input Power Cycle	60 Cycle (50 or 25 Cycle Optional)
Line Demand	6 Amperes @ 100% Duty Cycle 19 Amperes @ 10% Duty Cycle
Single Phase Weld Transformer	 1.0 KVA @ 50% Duty Cycle
Truck Mounted Welder	2 Stationary Casters 2 Swivel Casters
Floor Space	24" x 24"
Overall Height	54"
Height to Welding Dies	45"
Welder Weight	Approx. 100 LBS
SUITABLE FOR BENCH MOUNTING	
Dimensions	
Overall Height	20"
Base Dimensions	9" x 7"
Height from Base to Welding Dies	12"
Welder Weight	Approx. 50 LBS.

2.0 GENERAL OPERATING INSTRUCTIONS

2.1 ELECTRICAL HOOK-UP INSTRUCTIONS

First determine that available electrical service in your plant corresponds to the nameplate rating located on welder housing. Electrical wiring to welder must be of sufficient size to deliver full ampere load with no appreciable loss during the weld cycle. The welder will not operate properly if there is more than a 10% variation in the line voltage. In general, the welder should be fused with a slow blow fuse of the 100% duty cycle rating. The minimum power cable size to the welder can be obtained by using this same current rating.

Refer to National Electrical Code and local electrical regulations for adequate power sizes; disconnect methods and fusing guidelines.

Remember line voltages to the welding machine are potentially dangerous should the power cords be damaged or severed. The welding voltages at the welding dies will not harm an operator since they do not exceed 10 volts.

2.2 SAFETY PRECAUTIONS

2.2.1 ELECTRICAL

Maintain electrical cables to welder in good repair. Welders must be grounded and connections securely tightened. Heat switch must not be changed to a new position while a weld cycle is in process. Disconnect electrical service before servicing the welder – high voltages are located within the base of the welder.

2.2.2 MECHANICAL

Operator while using welder must wear safety glasses. Keep all safety guards on welders and use properly. Operators must be instructed on the basic operation of unit to prevent injury. Check nameplate rating and keep within material size range for each welder.

2.3 WELDING DIES

The dies and shoes supplied with the welder will handle most size and material types within the range of the welder. For new weld applications consult the factory for special die and shoe sets.

3.0 BASIC OPERATING PARTS

3.1 WELD HEAT SELECTION SWITCH

Weld heat is selected by means of a tap switch with 10 steps of voltage. Number one indicates the highest setting and number ten the lowest. The switch is located in the front and center of the welder. (Ref. 4.0)

3.2 HEAD CLOSED SPACE SETTING

Turning the insulated screw that rides the space-adjusting cam located on the top of the headpiece makes this adjustment.

3.3 HEAD OPEN SPACE SETTING

A space-adjusting cam located on the top of the headpiece makes this adjustment. This setting determines the amount of burr that the weld will have. See charts for approximate settings.

3.4 LIMIT SWITCH SETTING

The weld limit switch controls the cutoff point of current flow to the welding dies. Turning an adjusting screw located on the left end of the movable headpiece makes this adjustment. See Charts for setting.

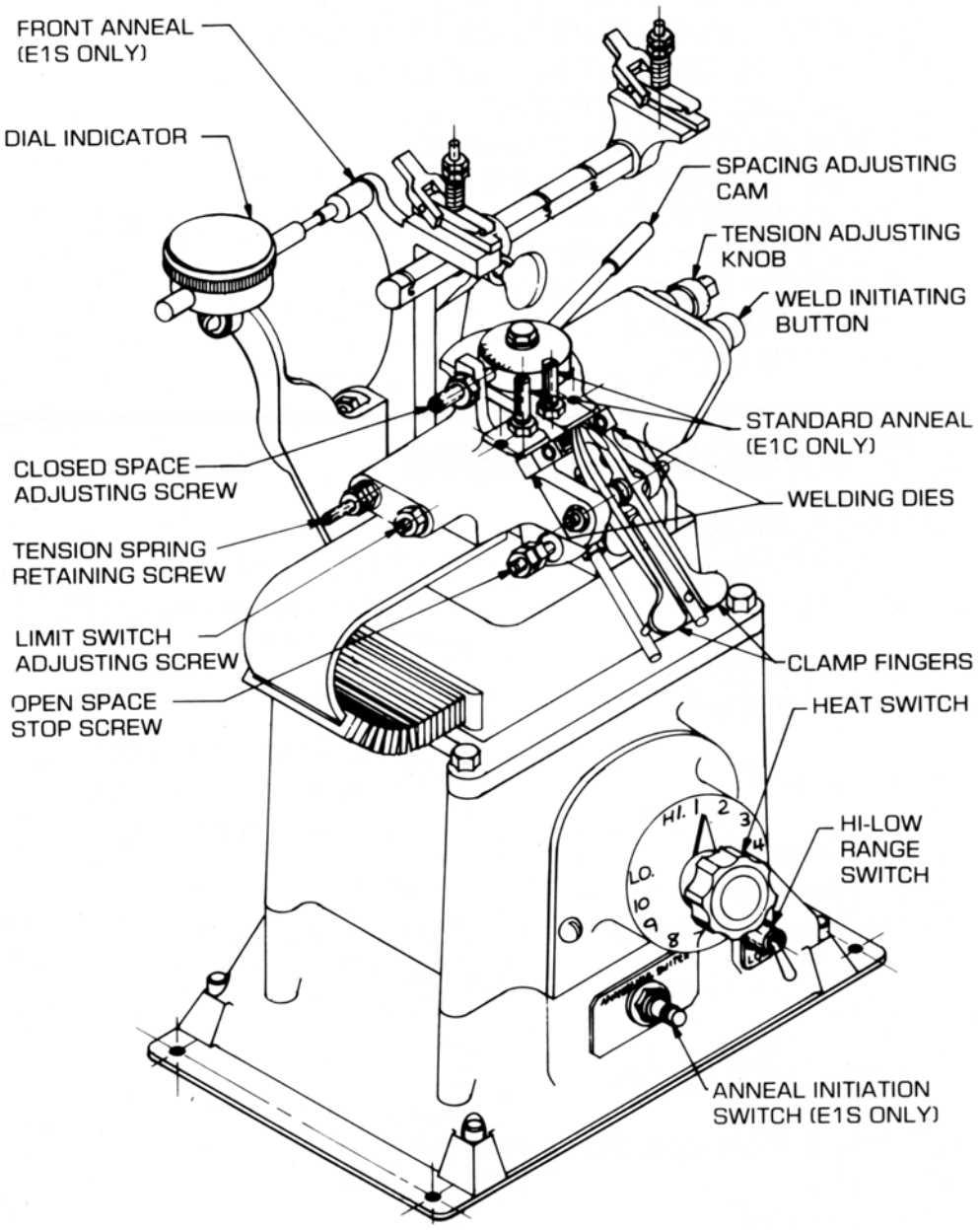
3.5 UPSET PRESSURE

Upset pressure adjustments are obtained by rotating the knurled knob on the right hand side of the stationary headpiece. When the outside edge of the adjusting screw is flush with outside edge of the knurled knob, the movable headpiece should just close when pulled to the left by hand and released. A calibrating screw and nuts located on the opposite left hand headpiece will assist in setting this positioning. Accompanying charts will assist in correct settings for various sizes of wire.

3.6 WELD INITIATING KNOB

The push button knob that initiates the weld cycle is located on the right end of the stationary headpiece.

4.0 BASIC OPERATING PARTS LOCATION



5.0 TYPICAL OPERATING SEQUENCE

Wire to be joined must be free of rust, corrosion or other insulating materials, clean wire where it makes contact with welding dies.

1. Adjust weld heat knob to proper setting.
2. Adjust tension-indicating knot to correspond to chart settings.
3. Rotate space-adjusting cam to correspond to chart settings.
4. Square cut each end of wire with cutter provided on unit
5. Place wires in correct welding die groove, so ends touch midway between open jaws.
6. Move magnifying glass away from weld area to prevent lens damage.
7. Rotate space adjusting cam handle to rear to ready unit for weld.
8. Push operating switch located on right hand headpiece and hold until weld is completed (less than 2 seconds required.)
9. Release clamp fingers and remove wire.
10. Hard drawn material or high carbon steel will require an anneal operation, handle carefully prior to anneal to prevent fracturing a brittle weld.

5.1 WELDING STRANDED MATERIALS- COPPER, ALUMINUM AND STEEL

A standard welding cycle of MICRO-WELD Model E1C and E1S is easily accomplished as noted in front portion of this manual.

Butt-welding of stranded materials at times may cause problems because of its multi-wire configuration. Stranded wire ends may be severed and fused electrically, on either unit, prior to welding to prevent fraying of the material.

A. Place spacing cam on #3.
B. Open clamp fingers and place stranded material across and into closest fitting die groove so it bridges the space between the dies.
C. Release clamp fingers clamping material securely into the die groove.
D. Push operating switch, which will in turn pass current through the material.
E. The current passing through the stock instantaneously severs and fuses the material.
   Note: Experiment with a heat, setting which will Produce the soundest fusion.
F. Release clamp fingers and discard the short piece of scrap.
G. Place second stranded wire into jaws and proceed as noted above.
H. At this time the two fused cables or conductors may be butt welded with standard techniques.
I. Trim off or swage burr to parent material size.

5.2 E1S – BURNOFF

To sever stranded steel cable, set space cam on #2. Place the cable in the proper groove, press-operating switch to sever it. Raise or lower Heat Switch setting to establish the best burn off condition.

5.3 ANNEALING PROCEDURE

5.3.1 STANDARD ANNEAL – Section 4.0

1. Place space cam between #1 and #2 so the electrical circuit is completed.
2. Carefully place wire into spring anneal posts with weld upset burr midway between posts.
3. Push operating switch located on right hand head-piece.
4. Allow wire to heat up to desired anneal temperature.

5.3.2 DIAL INDICATING ANNEAL – OPTIONAL

1. Carefully place wire into stationary anneal clamp (right hand side) and clamp into position.
2. Rotate movable clamp jaw to its extreme right hand position and clamp wire into jaws. Weld burr should be approximately midway between anneal clamps. Note distance between jaws may be varied to suit a variety of sizes. More accurate anneal will result if smaller diameter wires are annealed in a corresponding close position.
3. Push anneal button located on base of welder.
4. Allow wire to heat and observe the following:
   a. When heat is applied to wire, expansion of wire will occur.
   b. The dial indicator will start to move.
   c. When critical anneal temperature is reached, the needle will come to rest momentarily.
   d. In sequence, the needle will drop back slightly and move forward again.
5. At the beginning of the forward movement of the needle, release the anneal button.
6. Anneal cycles allowed to continue beyond this point will not be annealed uniformly.

5.3.3 FRONT TYPE ANNEAL – Section 4.0

1. Directions for dial type anneal maybe followed.
2. No dial device is furnished, so anneal temperature and rate of expansion is visually observed.

6.0 SPECIAL ADJUSTMENT

6.1 HEADPIECE CLOSED SPACE ADJUSTMENT

Closed space between dies should be 1/64" when the Space Adjusting Cam is set at zero.
To make this adjustment first move the Space Adjustment Cam to zero, then check the spacing between the dies.
If the space between the dies is not 1/64" at this time, loosen the locknut on the Space Adjusting Screw. Turn screw clockwise for more space and counterclockwise for less space. Once the space has been set tighten the locknut on the Space Adjusting Screw.

6.2 OPEN SPACE ADJUSTMENT

This adjustment determines the amount of upset burr. The adjustment is made by the space-adjusting cam. A pointer reflects the cam position. Refer to accompanying charts for approximate setting.

6.3 WELD LIMIT SWITCH

Do not put any wire in the dies when making this adjustment. Set the Space Adjusting Cam at #1 on cam. With a voltmeter measure across the clamp fingers with power applied to the welder. Press the weld button. The voltmeter reading should be approximately 3 VAC with welder at the highest heat setting. If no voltage is read move the Space Cam to a higher number. Return the cam to #1 while watching the voltmeter. The voltage should shut off at #1 on the cam.
Loosen locknut on the Limit Switch Adjusting Screw and adjust until welder shuts off at #1 on the Space Adjusting Cam. After setting tighten locknut on the Limit Switch Adjusting Cam, then tighten the locknut on the Limit Switch Adjust screw.

6.4 UPSET PRESSURE

Upset pressure adjustments are obtained by rotating knurled knob on right hand side of stationary headpiece. When outside edge of upset adjusting screw is flush with outside edge of thumb knob, movable headpiece should just close when pulled to the left by hand. A calibrating screw and nut located on opposite left hand headpiece will assist in setting the neutral position. Accompanying charts will assist in correct setting for various sizes of wire.

7.0 PREVENTIVE MAINTENANCE

7.1 AS REQUIRED:

Flashings must be removed from between welding dies and clamp fingers with a brush. If flashings are attached so that they cannot be removed by brushing with a soft wire brush, they may be broken loose with a scraper made of fiber or wood.

7.2 DAILY:

7.2.1 Check condition of welding dies and clamp fingers. Replace Dies or clamp fingers when they have become so worn that stock does not align or there is slipping of stock in the dies during upset pressure.

7.2.2 Check condition of clamp springs. Replace all broken springs or springs that have taken a set.

7.2.3 Check movable head for excessive wear. Have new slide shafts installed and die seats machined if stock does not line up when placed in die grooves.

7.3 MONTHLY:

7.3.1 Remove welding dies and clean bottom of die surface with #120 emery cloth. Do this by placing the emery cloth on a flat surface plate and rubbing the dies on it, keeping the surface of the die flat. Wipe die and die seat with a clean cloth and replace, taking care not to touch either contact surface with the hand.

7.3.2 Check anneal dies and replace worn or broken parts.

7.3.3 Check insulating fiber pin on limit switch adjusting screw for broken or frayed ends.

7.3.4 Check upset tension spring and clamp springs. Replace if springs have been over-stretched and will not return to normal position.

7.4 QUARTERLY:

7.4.1 Disconnect power to welder. Check contacts on operating and limit switch. Replace those that are burned.

7.4.2 Check anneal dies and replace worn or broken parts.

7.4.3 Check insulating fiber pin on limit switch adjusting screw for broken or frayed ends.

7.4.4 Check upset tension spring and clamp springs. Replace if springs have been over-stretched and will not return to normal position.

7.5 ANNUALLY:

7.5.1 Remove the movable headpiece and check condition of slide shafts. Wash slide shafts with low residue cleaner, lightly oil, than reassemble the headpiece.

7.5.2 Check condition of headpiece castings. If worn or broken, replace with new headpiece. If welder is used in an area where there are corrosive fumes, clean off all oxides and paint where possible.

7.6 WELDING DIE INFORMATION

Description:

Welding dies – Lower conducting electrode and clamp jaw.
Welding clamp fingers – Upper clamping member.

<u>WELDING DIES IN POOR CONDITION ARE THE MAIN CAUSES OF BAD WELDS.</u>

7.6.0 CARE OF DIE SETS

7.6.1 Use a Brass or fiber blade to remove particles of flashings that build-up on die sets. Excessive flash build-up causes die burns on material and shorting of die sets.

7.6.2 Do not attempt to clamp material that is not suited for welder into die sets. Undersize materials will slip and burn die grooves, oversized materials will overstress clamping parts.

7.6.3 Do not use welding die sets for a vise. These parts will not withstand the mechanical abuse.

7.6.4 Whenever welding dies are replaces, clean bottoms of dies and corresponding die seats to a bright and clean condition before bolting them tightly into place. An oxidized surface will insulate the welding dies and reduce effective welding voltage.

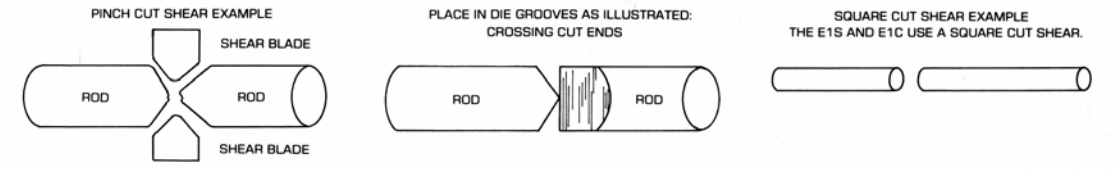
7.6.5 Welding die sets will wear with use and must be changed occasionally for good welding results. Keep and adequate supply of replacement parts available. Wire and rod slippage is a problem caused by poor die sets and a major cause of wire breaks.

8.0 SUGGESTED SETTINGS

SIZE	MATERIAL	DIE GROOVE	HEAT	SPACE	TENSION	RANGE	ANNEAL SPACE
.010	Steel	Front	10	2	1	Low	
.020	Steel	Front	8	2	1	Low	
.030	Steel	Middle	6	3	1 1/2	Low	
.040	Steel	Middle	4	4	1 1/2	Low	
.050	Steel	Rear	2	6	2	Low	
.062	Steel	Rear	1	8	2 1/2	Low	
.015	Copper	Front	7	1 1/2	1	Low	
.020	Copper	Front	4	2	1 1/2	Low	
.025	Copper	Middle	1	2 1/2	1 1/2	Low	
.030	Copper	Middle	8	3	2	High	
.040	Copper	Rear	6	4	2	High	
.050	Copper	Rear	4	5	2 1/2	High	
.015	Brass	Front	8	2	1	Low	
.025	Brass	Middle	5	2	1 /1/2	Low	
.032	Brass	Middle	1	2 1/2	1 1/2	Low	
.040	Brass	Rear	9	3	2	High	
.051	Brass	Rear	7	3 1/2	2	High	
.015	EC Aluminum	Front	8	1 1/2	1	Low	
.020	EC Aluminum	Middle	5	2	1 1/2	Low	
.025	EC Aluminum	Middle	1	2 1/2	1 1/2	Low	
.032	EC Aluminum	Middle	7	2 1/2	2	High	
.050	EC Aluminum	Rear	5	3	2	High	

NOTE: These settings are approximate and may be varied to suit needs.

8.1



9.0 DIAGNOSTIC CHART FOR TROUBLE-SHOOTING WELDERS

WELDING ACTION	CAUSE	REMEDY
Weld action normal but weld burr doesn't extend beyond wire	Lack of spacing space	Increase starting space until desired burr is obtained
Molten metal is blown out and ends not joined	Weld heat too high Stock is too small Low upset pressure	Lower heat settings Check size rating of welder Adjust upset
Weld has complete burr but is dry and breaks off below surface of wire	Upset pressure too great High carbon steel wire	Lower upset pressure Carbon-steel wire often appears like this, process wire by annealing weld before removing burr
Weld good but poorly aligned	Welding dies & clamp fingers Starting space Loose shafts	Replace worn dies and clamp fingers Decrease starting space Return heads to factory
Ends of wire buckle and may not weld	Upset pressure too great Low weld heat	Decrease starting space Increase weld heat
Varying weld results	Stock slipping Varying weld voltages Rod condition variations Dies Flashings	Check Clamp finger pressure Check electric lines Clean and tighten transformer connections to heads Clean Rod where clamped in dies Replace dies Clean build-up of flash materials

9.1 ELECTRICAL TROUBLE-SHOOTING OF WELDER

(CAUTION! Extreme care should be exercised when making these tests. Dangerous voltages are present in the welder. Only persons familiar with electrical safety precautions should perform these tests.)

9.1.1 TROUBLE-SHOOTING TABLE

(See section 9.1.3)

This electrical trouble-shooting table is furnished as a suggested method of trouble-shooting the welder. The individual steps of the table should be performed in the order given, to make the tests valid. The electrical schematic (section 10) furnished for these tests show the table test points. The table may be used for welders with a different but closely related wiring by using corresponding test points. (During all tests, line voltage should be connected to L1 & L2 of the welder. The heat switch should be set to the #1 position.

9.1.2 FINAL ELECTRICAL CHECKS

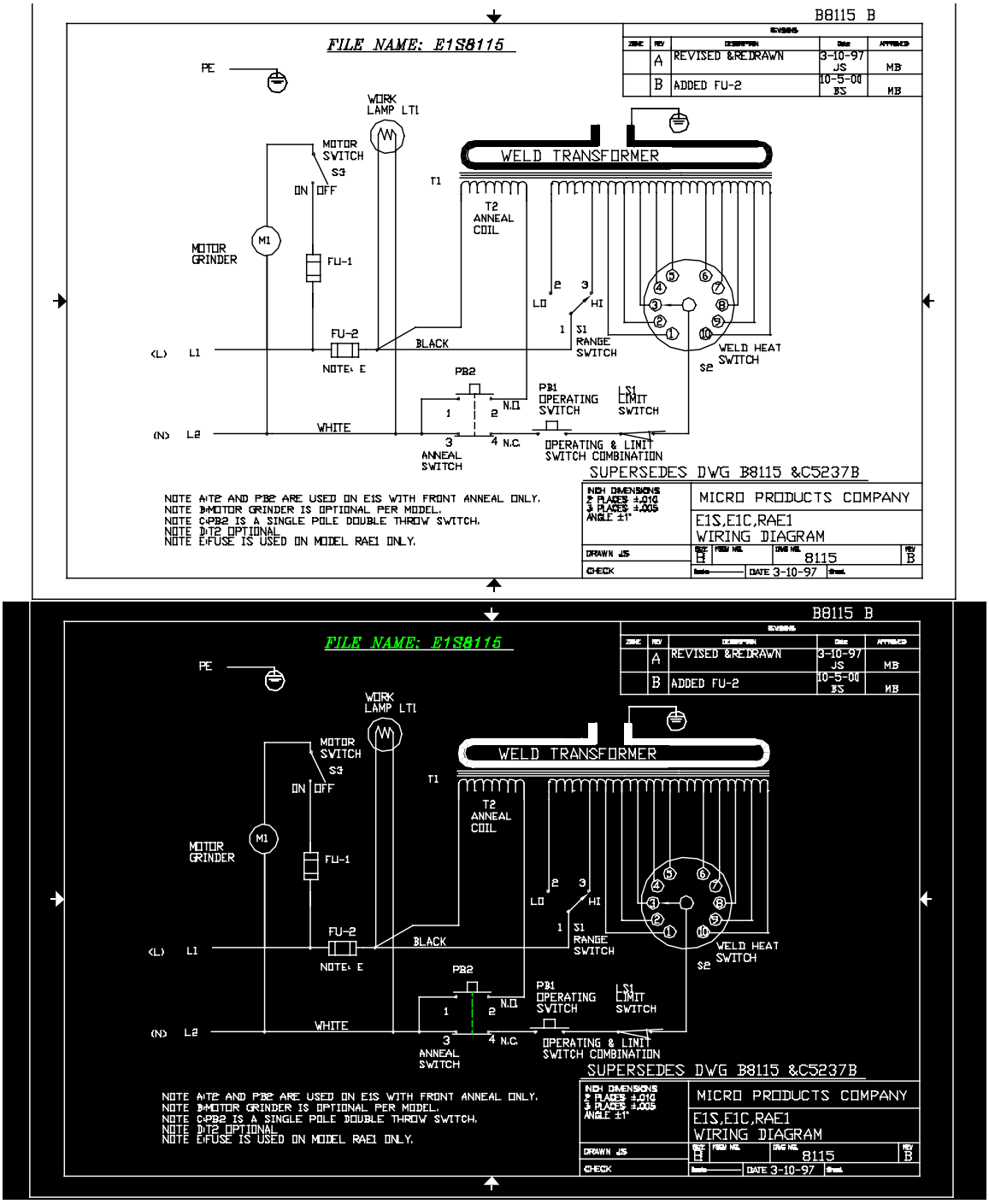
Set the heat switch to the number 1 position, connect the voltmeter across the welding dies. Press the operating switch. The meter reading will typically be less than 10 VAC. Consult the weld specification sheet for this value. Rotate the heat switch through all settings. If the voltage is not read at any setting, the heat switch may be defective. Actuate the weld limit switch; observe the reading goes to zero. Release the weld limit and operating switches, the reading should remain at zero.

9.1.3

TEST LEAD CONNECTION	METER READING	PROBLEM IF NO READING	PRESS OPERATING SWITCH	WELD LMIT SWITCH ACTUATED	PRESS ANNEAL SWITCH
L1 PB2-1	115VAC	Open wire to anneal switch			
L1 PB2-2	115VAC	Bad anneal switch			X
L1 LS1-1	115VAC	Open connection to weld limit switch	X		
L1 LS1-2	115VAC	Open weld limit switch	X		
L1 PB1-1	115VAC	Open wire to operating switch			
L1 PB1-2	115VAC	Bad operating switch	X		
L1 S2-1	115VAC	Open wire to heat switch	X		

Note: to perform repair consult section 13 for parts identification.

10. ELECTRICAL SCHEMATIC



B8115 B
FILE NAME: E1S8115
REVISED &REDRAWN
ADDED FU-2
PE
WORK LAMP LT1
MOTOR SWITCH S3
ON OFF
WELD TRANSFORMER
T1
T2 ANNEAL COIL
MOTOR GRINDER
M1
FU-1
FU-2
LO HI
S1 RANGE SWITCH
WELD HEAT SWITCH
S2
BLACK
WHITE
(L) L1
(N) L2
NOTE: E
PB2
N.O.
PB1 OPERATING SWITCH
LS1 LIMIT SWITCH
ANNEAL SWITCH
N.C.
OPERATING & LIMIT SWITCH COMBINATION
SUPERSEDES DWG B8115 &C5237B
NOTE A:T2 AND PB2 ARE USED ON E1S WITH FRONT ANNEAL ONLY.
NOTE B:MOTOR GRINDER IS OPTIONAL PER MODEL.
NOTE C:PB2 IS A SINGLE POLE DOUBLE THROW SWITCH.
NOTE D:T2 OPTIONAL
NOTE E:FUSE IS USED ON MODEL RAE1 ONLY.
MICRO PRODUCTS COMPANY
E1S,E1C,RAE1
WIRING DIAGRAM
DRAWN JS
CHECK
DWG NO. 8115
REV B
DATE 3-10-97

11.0 SAFETY REMINDERS

The following accident prevention information is presented to eliminate potential hazards while operating, inspecting or repairing Micro-Weld Electric resistance welding equipment.
Important safety compliance information for Micro-Weld Welders.

GENERAL

1. Qualified personnel, prior to using equipment, must instruct an operator on basic operation and malfunction methods.
2. Safety eyeglasses must be worn by all personnel operating or servicing welders.
3. Use safety equipment properly and keep safety equipment on welders.
4. Determine that both operating voltages and hertz (cycles) of power supply correspond to ratings listed on welder nameplate located on welder housing.
5. Check nameplate ratings and keep within capacities and material categories stated therein.
6. Adjustments or repairs must be made by persons thoroughly familiar with operating principles of welder.
7. Welder must be disconnected from power supply prior to maintenance or repair procedures.

ELECTRICAL

1. Refer to national Electrical Code and local regulations for adequate electrical wiring to power welder. Do not operate welder with inadequate electrical power supply cords or cable.
2. All welders must be grounded through power supply and welder ground connection terminal securely tightened.
3. All welders must be able to be disconnected from power source either by a double breaking disconnect switch or unplugged by standard rated plugs.
4. All welders must be fused to prevent injury should an electrical malfunction occur. Welders must never be fused for an ampere load that exceeds the ratings stated on welder nameplate. Normally welders are fused using the nameplate rated load; time lag parameters functional to standard fuse allow this specification.
5. Electric power cords to welder must be kept in good condition. Report any damage or potential hazards to maintenance personnel.
6. The weld head selection switch, potentiometer or range selection devices must not be changed to a new position while a weld operation is in process.

12.0 BUYERS GUIDE

HOW TO ORDER PARTS:

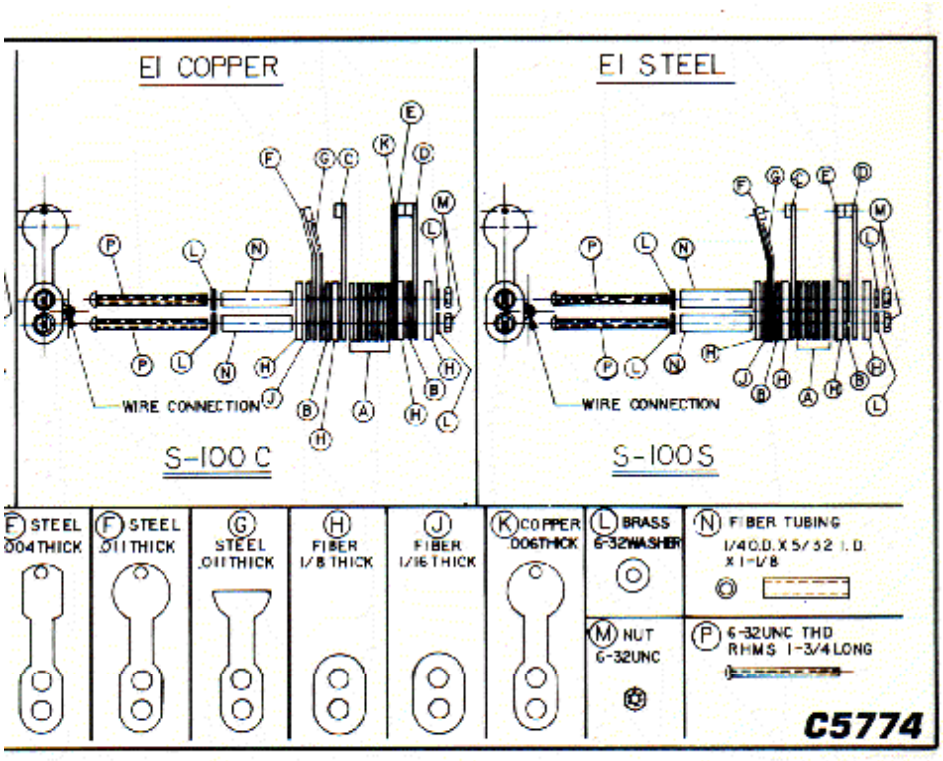
You must provide
1. Machine Model
2. Machine Serial Number
3. Voltage

Then identify part(s) on part list in section 13 and provide MICRO with the circled number

CALL MICRO at A.C. 630-787-9350

Provide MICRO with your company name and purchase order number.

13.0 PARTS LIST



PARTS LIST E1S, E1C

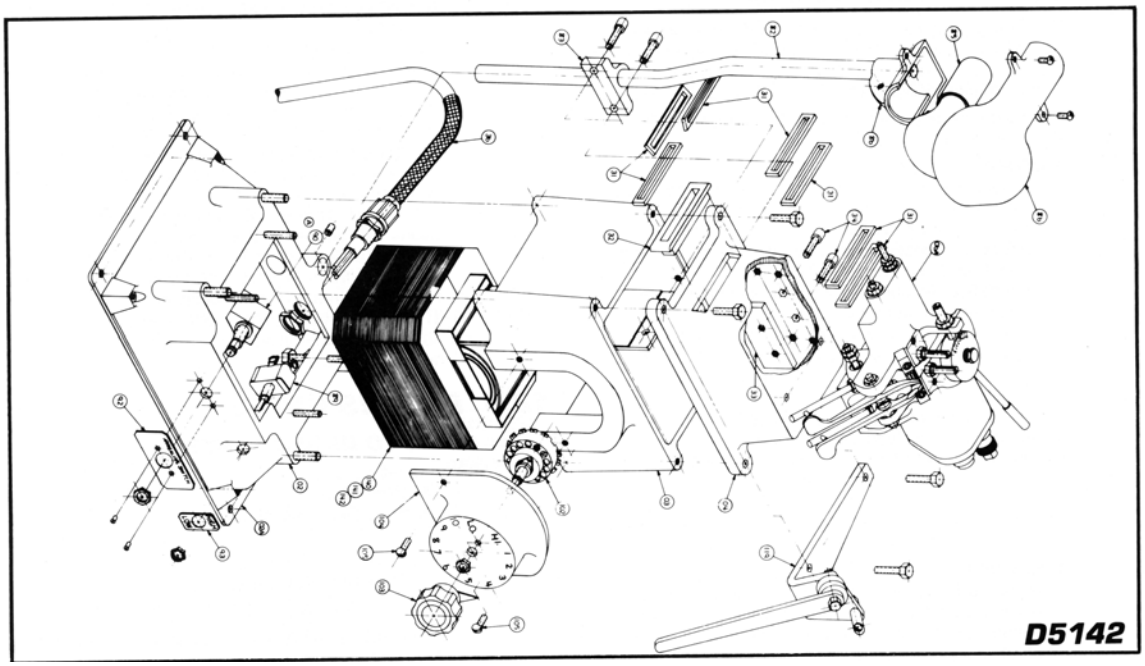
MODEL / PART NO.	DESCRIPTION	ITEM NO
E1-02	Welder base	42003
E1-03	Welder transformer housing	52005
E1-04	Welder transformer cap	
E1-05A	Headpiece stationary casting	
	Movable casting match	32012
E1-06A	Headpiece assembly with all operating	
	Parts and electrical switch (steel)	32010
	(Copper)	32011
E1-07A	Headpiece overthrow stop screw	
	& nuts	32028
E1-21	Tension adjusting knob	35564
E1-22	Tension adjusting worm with scale	35568
E1-23	Tension adjusting spring, standard	80002
E1-23A	Tension adjusting spring, light duty	80004
E1-24	Tension spring retaining screw & nut	32035
E1-25A	Space adjusting cam and handle assembly	32003
E1-26	Space adjusting cam repeatable stop	32000
E1-27	Space adjusting cam bushing	32002
E1-28	Space adjusting cam attaching screw	90217
E1-19	Space and nut adjusting screw	
E1-70A	Clamp fingers, pair, wide tip	32016 - 17
E1-72A	Clamp fingers, pair, narrow tip	32018 - 19
E1-74	Clamp finger stop pin and locknut	32020
E1-75	Clamp finger return spring	80007
E1-76	Clamp finger return spring attaching	
	Screw and nut	91025
E1-77	Clamp finger attaching screw and locknut	32064
E1-38	Limit switch cover	32004
E1-39	Limit switch cover attaching screw with	
	Insulation	91055
E1-40	Operating switch button, inner and outer	
	with screw	32005
E1-55	Limit switch adjusting screw & locknut	52008
E1-S100S	Limit and operating switch assembly,	
	complete for steel welders	56507
E1-100C	Limit and operating switch assembly,	
	Complete for copper and aluminum welders	56508
E1-68	Welding dies, pair	32024
E1-69	Welding die attaching screw, 2 required	90702
E1-90	Switch, anneal, single pole type	32089
E1-92	Switch, anneal, nameplate	48307
E1-89	Switch, high-low	57839
E1-93	Switch, high-low, nameplate	48306

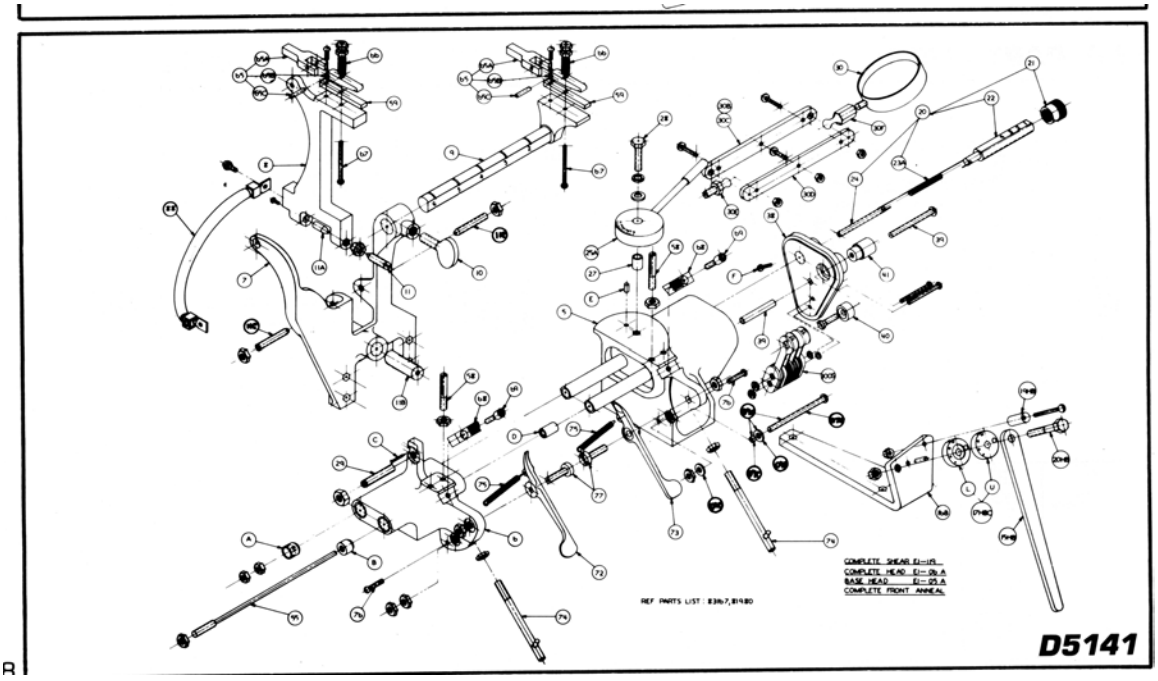
PARTS LIST E1S, E1C

MODEL/ PART NO.	DESCRIPTION	ITEM NO.
E1-58	Anneal pin with retaining clip, 2 required	32029
E1-07	Anneal frame stationary	62003
E1-08	Anneal frame movable	62004
E1-09	Anneal bar adjustable	62000
E1-10	Anneal bar locking screw	93069
E1-11	Anneal frame bearing center, adjustable	62001
E1-11A	Anneal frame bearing center, fixed	62148
E1-11B	Anneal frame bearing nylon	62002
E1-59	Anneal die with mounting screw, lower 2 required	62009
E1-65	Anneal die shoe compression spring	32030
E1-66	Anneal die shoe compression spring, 2 required	80005
E1-67	Anneal die shoe compression spring mounting Screw and nut, 2 required	91028
E1-88	Anneal frame flexible power shunt	62006
E1-94	Dial indicator assembly with mounting case	77851
E1-96	Dial indicator contact button	62012
E1-97	Dial indicator attaching screw, insulated Washers and nut	90203
E1-102	Heat selection switch, 10 taps, 10 amps	57800
E1-103	Heat selection switch knob, 10 amp type	48214
E1-104	Heat selection switch housing	42001
E1-105	Heat selection switch housing attaching screw, 2 required	91048
E1-113	Truck assembly, complete with foot release Mechanism	42005
E1-114S	Caster assembly, swivel type	48100
E1-114R	Caster assembly, rigid type	48101
E1-114W	Caster wheel only, either rigid or swivel	
E1-115	Vise	60000
E1-119	Complete shear assembly with mounting Bracket	64002
E1-16B	Mounting bracket	64001
E1-15HB	Shear handle	64000
E1-19HB	Shear stop cam and screw	64004
E1-17HBC	Shear cutter blades, pair	64042
E1-20HB	Shear cutter blades attaching screw & nut	64021
E1-81	Lamp assembly complete	52006
E1-82	Lamp post	52007
E1-83	Lamp post holder	52003
E1-84	Lamp bulb, 25 watt, 120 volts	58151
E1-85	Lamp receptacle, standard base	58166
E1-86	Lamp shade casting, upper	32013
E1-87	Lampshade casting, lower	
E1-30	Magnifying glass and frame	78601

PARTS LIST E1S, E1C

MODEL/ PAT NO.	DESCRIPTION	ITEM NO.
E1-30B	Magnifying glass and bracket assembly	68005
E1-137	Guard, flash shield	32069
E1-140	Welding transformer, 120 volts, 60 hertz – Application: Copper and aluminum wire – State serial number of welder	52014
E1-141	Welding transformer, 102 volts, 60 hertz – Application: Steel wire, standard anneal – Note: welder has combination operating and Anneal switch. State serial number of welder	52015
E1-142	Welding transformer, 120 volts, 60 hertz – Application: Steel wire, front anneal – Note: welder has separate anneal switch Located on front lower base – State serial number of welder	52016
E1-31	Insulating fiber washer, transformer strap	37728
E1-32	Insulating sleeve, transformer strap	37709
E1-34	Attaching screw, transformer strap	90202


D5142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